

What is claimed:

1. An apparatus for determining a blood flow in a vessel, comprising:

(a) an elongate catheter having an angioplasty balloon, a blood property change port and a downstream sensor spaced from the port for producing a signal corresponding to a blood property.

2. The apparatus of Claim 1, wherein the sensor and the catheter are configured to locate the sensor with respect to the vessel to minimize wall effects.

3. The apparatus of Claim 1, further comprising a controller operably connected to the sensor to calculate a flow rate corresponding to the signal from the downstream sensor.

4. The apparatus of Claim 1, wherein the blood property change port includes an aperture for introducing a blood property variant.

5. The apparatus of Claim 1, wherein the blood property change port and the sensor are spaced by a sufficient distance to substantially mix a dilution indicator introduced through the port and the blood flow.

6. The apparatus of Claim 1, wherein the blood property change port includes one of a heat sink and a heat source for creating a local temperature gradient.

7. The apparatus of Claim 1, wherein the signal from the sensor corresponds to a blood flow in the vessel.

8. The apparatus of Claim 7, wherein the correspondence relates blood flow to 
$$= \frac{V}{\int C(t)dt}$$

where V is the volume of indicator introduced and  $\int C(t)dt$  is an area under a dilution curve.

Sub C4 9. A stenosis reducing catheter, comprising:

(a) a stenosis reducing member selectively actuatable to reduce stenosis in a vessel;

(b) a port for inducing a blood property change; and

5 (c) a sensor spaced from the blood property change port for providing a signal corresponding to a change in a blood property.

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10. The catheter of Claim 9, wherein the sensor and the catheter are configured to locate the sensor with respect to the vessel to minimize wall effects.

Sub C3 11. The catheter of Claim 9, further comprising a controller operably connected to the sensor to calculate a flow rate corresponding to the signal from the downstream sensor.

12. The catheter of Claim 9, wherein the port includes an aperture for introducing a blood property variant.

13. The catheter of Claim 9, wherein the blood property change port and the sensor are spaced by a sufficient distance to substantially mix a dilution indicator introduced through the port and the blood flow.

14. The catheter of Claim 9, wherein the port includes one of a heat sink and a heat source for creating a local temperature gradient.

15. An apparatus for determining blood flow, comprising:

(a) a dilution indicator source;

(b) an angioplasty catheter connectable to the dilution indicator source, the angioplasty catheter having an angioplasty balloon, a dilution indicator port for passing a dilution indicator therethrough and a downstream sensor for producing a signal corresponding to passage of the dilution indicator; and

(c) a controller connected to the dilution indicator source and the sensor for calculating a blood flow in response to the signal from the sensor.

16. A method for quantitatively measuring an angioplasty induced flow change, comprising:

(a) inserting a catheter and a blood property sensor into a vessel having a blood flow corresponding to the angioplasty;

(b) introducing a first change in a blood property upstream of the blood property sensor;

(c) detecting passage of the first change in the blood property at the blood property sensor;

(d) expanding an angioplasty member;

(e) introducing a second change in the blood property upstream of the sensor;

(f) detecting passage of the second change in the blood property at the blood property sensor; and

(g) determining a change in blood flow corresponding to the  
15 detected passage of the first change in the blood property and the second change in the blood property.

17. The method of Claim 16, wherein inserting a catheter and a blood property sensor into a vessel having a blood flow corresponding to the angioplasty includes inserting a first catheter having the angioplasty member and a second catheter having the  
5 blood property sensor.

18. The method of Claim 16, wherein inserting a catheter and a blood property sensor into ~~a~~ vessel having a blood flow corresponding to the angioplasty ~~includes~~ inserting a catheter having the angioplasty member and the blood property sensor.

19. A method of monitoring blood flow during angioplasty, comprising:

- (a) inserting an angioplasty catheter into a vessel;
- (b) expanding the angioplasty catheter;
- 5 (c) introducing a first blood property change;
- (d) detecting passage of the first blood property change past a downstream sensor on the catheter; and
- (e) calculating the blood flow in response to the change in blood property and passage of the blood property past the  
10 downstream sensor.

20. An apparatus for determining a blood in a vascular passage, comprising:

(a) a catheter having means for increasing the effective size of a portion of the vascular passage, the catheter including a dilution indicator introduction port and a downstream blood property sensor; and

(b) a controller operably connected to the blood property sensor for calculating a flow through the vascular passage corresponding to a signal from the blood property sensor.

21. The apparatus of Claim 20, wherein the controller determines the flow corresponding to the relation

$$AF = \frac{V}{\int C(t)dt}$$

where AF corresponds to the flow, V is a volume of indicator introduced and  $\int C(t)dt$  is the area under a dilution curve.

22. An apparatus for determining an intra-procedural blood flow in a vascular corrective procedure, comprising:

- (a) a catheter;
- (b) a blood parameter altering section on the catheter;
- (c) means for effecting the corrective produce; and
- (d) a blood parameter sensor connected to the catheter and spaced from the altering section.

23. The apparatus of Claim 22, wherein the blood altering section includes one of a port and a temperature gradient generator.

24. The apparatus of Claim 22, further comprising a controller connectable to the altering section and the blood parameter sensor to calculate the blood flow.

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25. A method of monitoring a stenosis reducing procedure in a vessel, comprising:
- (a) locating a blood parameter altering section in the vessel;
  - (b) locating a blood parameter sensor downstream of the altering section;
  - (c) performing the stenosis reducing procedure; and
  - (d) determining a blood flow in response to a passage of an altered blood property past the blood parameter sensor.
26. The method of Claim 25, wherein performing the stenosis reducing procedure includes angioplasty.
27. The method of Claim 25, further comprising locating the blood parameter sensor to reduce wall effects from the vessel.
28. The method of Claim 25, further comprising rotating the blood parameter sensor with respect to the vessel to reduce wall effects from the vessel.
29. The method of Claim 25, further comprising locating a plurality of blood parameter sensors in the vessel.

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